

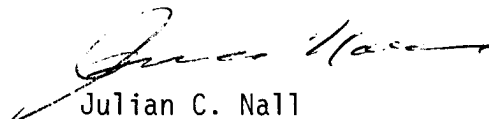
MEMORANDUM FOR: Director of Central Intelligence

As promised, I forward to you:

-- A summary of the report on "The Information Technologies in Soviet Society: Problems and Prospects"

-- The original report

We look forward to receiving your comments on the summary, so that they may be incorporated in a typescript which will be available for you on Monday evening. Conferees will have copies on Wednesday.

  
Julian C. Nall  
NIO/S&T

Att

Date 7 Nov 86

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The Information Technologies in Soviet Society:  
Problems and Prospects

SUMMARY

What Is an Information Society?

While there is no universally accepted definition of a Western-style "information society," the following two emerging trends characterize it in a general (and for our purposes acceptable) way:

- o An explosive expansion in the amount and availability of information.
- o The pervasive application of the information technologies, especially those involving computing and communications (C&C).

At almost every level of Western societies, individuals and institutions have expanding access to an increasing range and amount of information, together with a growing number of choices as to how and when to exploit this access. This phenomenon is generally associated with democratization and decentralization, but there is no technical reason why this needs to be the case.

The pervasiveness of a technology in society can be described in terms of how far it has progressed through five stages of proliferation. A technological product might be:

- o One. An experimental rarity, perhaps an entrepreneurial discovery.
- o Two. An exotic toy or tool used by a small group of experts.
- o Three. An item that is well-known and manufactured in modest quantity but chiefly for use in limited industrial or other institutional environments.
- o Four. An item in widespread production and whose use is more or less routine among a broad spectrum of the population.
- o Five. An item that has become part of the fabric of daily life and whose absence would be more noticeable than its presence.

In the West, the pervasiveness of the C&C technologies is rapidly increasing on a broad front. Many have progressed within

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only a few years from stage one to stage four or even five -- consider, for example, the proliferation in the United States of VCRs in recent years. Several factors have been driving this technological explosion:

- o The increasing complexity of the modern world coupled with reduced time-scales during which effective decisions and actions are feasible. The proliferation of the C&C technologies has been partly responsible for these developments; nevertheless, without the continually expanding use of these technologies, Western societies would quickly regress.
- o There are huge and diversified markets for C&C products and services. In the United States, customer groups with massive, voracious, and insatiable appetites for such technology range from teenagers to the Department of Defense. They exert a tremendous demand-pull on the industry.
- o Almost no part of the C&C industry is free from intense, often debilitating, and sometimes devastating competition, both domestic and foreign. The need for the firms that would survive to keep up with their competition drives them to create, innovate, reduce prices, increase capabilities, constantly offer new products. The C&C technologies offer unusually fertile ground for innovations. The result is supply-push, a dizzying proliferation of new capabilities and products, in many cases coupled with the instant obsolescence of their predecessors.

The core of the Western information industries consists of private companies, universities, and government facilities providing research, development, production and services closely connected with the C&C technologies. The range, number, and spread of the units comprising these industries is enormous. The spectrum is densely filled with everything from tiny, local, single-product firms to national and international giants like AT&T and Hitachi, with strong and deep forms of vertical integration. The rates of appearance of new products and incremental innovations are awesome. Cost and performance capabilities of new products change dramatically over just a few years. If one overarching word were to be applied to these industries and the applications they fuel, that word would be "fast." (Table 1 summarizes the characteristics of a Western-style information society.)

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Table 1

A Western-Style Information Society

Best characterized by emerging trends:

- Pervasive application of the C&C technologies.
- Expanded access to information.

Driving forces:

- Opportunities for innovations inherent in the C&C technologies.
- Large and diversified push-pull markets.
- Fierce domestic and international competition.

Systemic Conditions:

- Little national level control of social change.
- Organizational flexibility.
- Relatively weak controls on access to and dissemination of information.
- Supports the broad dissemination of controls for economic efficiency, private activities and for more communications of all kinds.

Development and application of the C&C technologies:

- Interest in all technology areas.
- Technological strength in all areas.
- Interest in all applications areas.
- Near-universal user community.

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Current Status of Information Technologies in the USSR

In the Soviet Union there is no private development of information technology. Basically, information and the means of disseminating it are regarded as government property. In general, information technology is much less pervasive in the USSR than in the West. Only government controlled media (radio, TV, newspapers) have reached the fifth stage of proliferation. That is not to say that the development of information technologies is not taken very seriously in the Soviet Union.

At least eight ministries and one department of the Soviet Academy of Sciences are directly and heavily involved in information technology research, development, product, training, and service functions. Several other ministries supply related equipment and services -- air conditioners, power supplies, high-quality paper, and so on -- although the Soviets tend to underestimate their importance to the C&C technologies. A large number of high level Soviet state and CPSU organizations, such as the recently formed State Committee for Computing and Informatics (GKVTI), have important, long-term functions in the areas of information technology policy, planning, and trade, and in the acquisition of foreign C&C technology. A refined mapping of participating suborganizations and their interrelations would be impressive.

On paper, this array gives the USSR a comprehensive set of industries and functional capabilities. Included are the full range of computer systems from microprocessors to supercomputers and fifth-generation machines; a wide assortment of telecommunications options; extensive educational, research, and development facilities, and coverage of the computer-aided design and manufacturing (CAD/CAM) spectrum. Furthermore, the Soviet Union has a community of internal users with the size, diversity, and sophistication of applications to warrant and support all of this. Only the United States and Japan exceed the totality of Soviet capabilities.

In reality, the picture is rather spotty. Respectable development and production programs exist for microprocessors, multiboard minicomputers, and upward compatible general purpose mainframes. Most of the most widely produced and used systems in the Soviet general economy are functional duplicates of successful US systems that were in US production from the mid-1960s to the early 1980s. In no case has Soviet production volume or system reliability reached contemporaneous US standards, and serious deficiencies in quality and availability continue. Since the early 1970s the Soviet computer industry has grown at an average pace of 10 percent annually, with some areas displaying bursts of much faster growth.

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The massive reorientation of Soviet C&C development towards Western technology in the late 1960s led to a decline in the level and relative importance of domestic innovation in computer systems hardware and software, and this continued into the 1980s. However, an enormous amount of on-site engineering development and implementation was necessary in order to assimilate Western technology and to produce respectable machines in quantity. Albeit unimpressive compared with the best Western performances, this was a substantial achievement. On the other hand, we know of no Soviet accomplishments that significantly advance world-level frontiers -- although some recently announced projects may indicate a renewal of indigenous design efforts.

Not World-Class, But Not Bad. Soviet claims that they can achieve world levels across the complete spectrum of the information technologies and applications solely on the basis of their own indigenous capabilities are not supported by history, detailed technological assessments, or international trends. Down through the years, Soviet computing has been hurt badly by various forms of Western- and self-imposed isolation. No computing community, including that of the US, would be able to move at its current pace if it were to have its contacts with the rest of the world severely restricted. Nevertheless, the Soviets have achieved a degree of self sufficiency in that they run a large industry of their own, and produce most of what they use. They have also become less dependent on Western technology in the sense that, if all their overt and covert transfer opportunities were to suddenly disappear, they would be able to function indigenously at a level far above the one that existed in the late 1960s.

Problems. Among the most important information technology problems facing the USSR is the absorption of C&C technologies and products at the enterprise level: in factories, research institutes, educational centers, service organizations, assorted forms of associations, and so on. Almost everything else the Soviets do with computing will be substantially devalued if they do not make serious progress here. In principle, C&C technologies could be used to create an enormous spectrum of centralized and/or decentralized systems across the entire economy of the USSR. In practice, the Soviet Union has experienced considerable difficulties in establishing even a modest level of automation, whether in the field of management information systems (MIS) or CAD/CAM applications, or whatever.

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The limited absorption of such technology is not due to any one overriding cause but represents a confluence of technical, organizational, economic, and political constraints affecting users, service suppliers, and higher-level organizations. These constraints may be amalgamated into two broad areas: infrastructural and environmental. If significant progress is to be achieved, both must be addressed. Improvements in just one area would have only marginal impact. For example, table 2 describes the differences between the idealized goals of a Soviet automated enterprise management system (ASUP) and the pragmatic goals of an enterprise manager just trying to survive in the Soviet industrial environment. No computer program could bridge this chasm.

Table 2

Idealized ASUP and Pragmatic Manager Goals Compared

<u>Idealized ASUP</u>	<u>Pragmatic Manager</u>
Maximize and optimize production.	Minimize current production targets so next year's higher targets are also fulfillable.
Optimal (minimal) levels of inventories.	Acquire as many supplies as possible.
Release labor.	Hoard labor.
Maximize plan flexibility.	Minimize plan target changes.
Realistically evaluate capacity.	Understate capacity.
Realistically evaluate actual performance.	Overstate performance if necessary.
Use computer to audit, control, cross-correlate, analyze.	Avoid dangerous revelations to superiors; find out as much as possible about subordinates.
Improve data processing.	Improve data processing.

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Will There Be a Soviet-Style Information Society?

Compared with in the West, in the Soviet Union the role of the information technologies has been much smaller and the pace of their development has been much slower. The most important difference between the USSR and the West, however, lies in the realm of government control. The development of the Western information societies has been only partly a consequence of government policies and actions. Other factors -- competition, consumer demand -- have been equally, if not more important. Western governments, on the whole, have tried to facilitate the proliferation of C&C technologies in an almost unconstrained fashion. The Soviet Union has also tried to facilitate the proliferation of C&C technologies, but within severe constraints whose preservation has been deemed at least as important as technological development.

The Western countries have dived headlong into the information age. The Soviet Union has hardly reached the brink. Is it necessary for the USSR to emulate the West? Or can it accomplish its objectives while restricting the development and application of its C&C technologies to a point below the threshold of an information society? We believe that the USSR has no choice but to dive in, too. But the Soviet version of an information society is likely to be quite different from its Western counterpart. (Table 3 on the next page summarizes the likely characteristics of a Soviet-style information society, based on the analysis presented in the balance of this paper. Compare with table 1.)

The Driving Forces. Like the West, the Soviet Union perceives the necessity of improving its C&C technologies to cope with the increasing complexity and time-constraints of the modern world. On the other hand, its information industries are much less affected than their Western counterparts by factors such as cutthroat competition and civilian consumer demand, and much more affected by government attitudes and policies. Those attitudes and policies are a function of the government's goals, which in terms of their relevance to the development of C&C technologies may be described as follows:

- o To modernize the industrial base and improve productivity.
- o To improve economic planning and control mechanisms.
- o To support both military and internal security needs.
- o To present the image of a technologically progressive society to both the Soviet people and the outside world.

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Table 3

A Soviet-Style Information Society

Best characterized by centrally formulated goals:

- To modernize the industrial base and improve productivity.
- To improve economic planning and control mechanisms.
- To support both military and internal security needs.
- To present the image of a technologically progressive society to both the Soviet people and the outside world.

Driving Forces:

- National-level political processes.
- Western achievements.

Systemic Conditions:

- Powerful national level controls on social change.
- Organizational rigidities.
- Strong controls on access to and dissemination of information at both upper and lower levels.
- A strong form of centralized planning and control.
- A leadership that distrusts the general population.

Development and application of the C&C technologies:

- Interest in most technology areas.
- Modest technological capabilities in most areas.
- Interest in a relatively small number of applications areas narrowly related to goals.
- Restricted, insular, relatively small user communities.

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Some Similarities. There would be some threads in common among the Soviet and Western information societies in addition to their mutual need to cope with an even more complex world. Both societies view the information technologies as an increasingly necessary means for the control of economic production, distribution, and demand. Both also see these technologies as ways to disseminate noneconomic information, to manage military and intelligence activities, and to control the volume and efficiency of information exchange in the various sectors of society. Both the Soviet Union and the Western countries are seeking to use C&C technologies for two somewhat divergent purposes -- greater concentration of control but also greater distribution of control.

Major Differences. The emphases, however, are different. The trends in the West are toward very broad dissemination of information technology, both to improve economic flexibility and efficiency and to promote interpersonal communications of all kinds, consistent with national security. To these ends, the West is developing a mixture of centralized and decentralized information flow control mechanisms in both the public and private sectors. By comparison, the prospective Soviet information dissemination controls will be much more limited and focused and much more subject to centralized government oversight. Nevertheless, many Soviet officials realize that some form of more distributed hierarchial control will be necessary, if not exactly desirable.

#### Soviet Prospects During the Rest of the Century:

##### Industrial Modernization

9 This is one of the Gorbachev administration's overarching goals. ~~Success or failure~~ here will greatly affect the extent to which the ~~other three goals~~ are realized. The proposed means for modernizing industry and improving productivity are a combination of more discipline, less waste, and greater automation. C&C applications are at the core of the Soviet program. Properly developed, such technologies could:

- o Ameliorate the effects of the looming Soviet labor shortage.
- o Facilitate basic industrial modernization in both the manufacturing and the R&D sectors, increasing the volumes and quality of goods produced.

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- o Provide improved ways of monitoring industrial performance, enhancing to impose discipline and reduce waste.

Whether the USSR can accomplish this transformation depends on the answers to a number of questions, such as whether the Soviet information industries would actually be capable of providing the technology needed to support industrial automation, and whether general systemic conditions would permit such automation, or whether superstructure problems of the sort that have plagued ASUPs for 20 years would continue to be a major impediment. There are two plausible ways to look at the situation:

- o The first view holds that the attainment of progressively deeper stages of technological pervasiveness is contingent upon the interplay between a capable industry and a receptive and supportive infrastructure. A healthy industry fosters demand by offering alluring applications (supply-push), while a structural ability to absorb applications stimulates the industry to respond (demand-pull). A society in which microcomputers (PCs) are omnipresent is both more likely to stimulate the development of new PC hardware and software and better able to absorb it. The proliferation of information technologies among the Soviet rank and file will be much less extensive than it has been in the West; thus, compared with the West, the demand-pull side of the equation will be deficient. Even if the technology is made available, the Soviet system may not be able to fully exploit it.
- o The alternative view recognizes that the Soviet C&C industries are already large and rather capable. They cover the full spectrum of the relevant technologies. While they may not match the highest Western standards, they can perform at a reasonable level -- especially with the aid of the additional foreign technology that is likely to be available. The systemic changes needed to overcome the gross problems associated with the ASUP program can be arranged. It is not true, according to this alternative view, that the widespread proliferation in Soviet societies of personal computers, information-based entertainment applications, telecommunications networks, and so on is a prerequisite for successful large-scale industrial automation. One can, for example, learn to work effectively in a robot-intensive environment without having a PC at home.

We take a middle position. The Soviets will provide significant additional resources to the C&C industries to help them improve their performance, and they will make improvements in infrastructure, but these steps will not be sufficient to

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support the general level of automation that achievement of the Soviet industrial productivity goals will require, although automation in selected sectors might be adequate. Demand-pull will still be too anaemic to prod the C&C industries into overcoming their fundamental deficiencies in hardware reliability and service, and software development and support. The Soviets could help unfetter demand by permitting some development of private industry in the C&C applications area, and it could improve the interface between suppliers and consumers by allowing enterprises to act more autonomously, so they could respond somewhat more efficiently to existing demand. But we see no current indications that the Soviets mean to adopt such policies.

Structural Problems Will Probably Persist. We think it likely that many of the structural problems that have afflicted the ASUP program will also handicap the industrial automation program. From the viewpoint of the hard-pressed industrial enterprises, computer-aided manufacturing (CAM) has fewer drawbacks than industrial management information systems (MIS) like ASUP. Moreover, CAM is compatible with the achievement of Soviet-style quantity-oriented productivity increases, especially when it is implemented on a localized basis over a short period of time. But most of Soviet industry is still dubious about the prospective benefits of a greatly increased reliance on C&C technologies. In the Soviet environment, increased use of computer technologies relieves some problems but exacerbates others, often generating rather than relieving inefficiency; while improved communications offer no solace to an enterprise manager who is trying to conceal how badly he is coping.

The Soviets hope to overcome these problems partly through incremental structural changes and technological improvements, and partly by fostering a new mentality in younger workers and managers. By exposing them to the information technologies at school, Soviet officials hope they will be more amenable to employing such technologies later, on the job. A growing cadre of young, computer-literate workers and managers may be both more able and more willing than their predecessors to make effective use of what will be available. In the short term, they should also create additional demand from below; in the long term, perhaps they will be able to devise better solutions to Soviet industrial problems. This approach is being advocated by several prominent academicians and technocrats, and they are gaining political support, perhaps because nobody can think of better or more feasible alternatives.

The intensity of these Soviet efforts should not be underestimated, nor should their likely consequences. In the short term, there will be several prominent successes due to automation, which the Soviets are likely to exaggerate, both to themselves and to the outside world. Initial work and experimentation will take place both in high priority military-industrial sectors and in lesser sectors chosen to

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reflect priorities arising from the other three Soviet industrial goals. In time, several concentrations of advanced industrial automation will emerge. The rest, perhaps most, of Soviet industry is likely to be left behind in a backwater even more distant from the advanced sectors and their Western counterparts than is the case today.

We expect technical process control (TPC) systems to be introduced most rapidly. The Soviets have been adding more than 500 of these per year, and this rate can be expected to increase as a result of technical progress. By the end of the century, most important, well-understood, and not exorbitantly expensive processes will be at least partially computer controlled. Management information systems will be introduced at the slowest rate, since the structural problems impeding them will prove most intractable. The introduction of robots and flexible manufacturing systems (FMS) will proceed at intermediary rates, with robots likely to be introduced in greater profusion than FMS and more integrated forms of CAM. Overall, however, with regard to the utilization of C&C technology, the gap between the Soviet Union and the West will probably remain and may widen, especially relative to the most advanced Western sectors.

#### Economic Planning and Control

We expect the USSR to remain strongly wedded to comprehensive central planning. Soviet efforts to maintain close control over an increasingly complex economic domain and planning process will mandate increasing reliance on C&C technologies. By the year 2000 there will probably be a substantial amount of data exchange via telecommunications, and computerized data base technologies will be in wide use. Computers will be almost universally employed to collect, store, and process data from industrial enterprises. Several pernicious "environmental" problems will almost certainly persist, even though they are recognized as problems at the highest levels:

- o First, the planning and control process is and will remain highly political. Industrial decisions will not necessarily be made on economic grounds.
- o Second, computerization will probably not change substantially the nature of the data that is collected, nor the deficiencies in the way it is processed.
- o Finally, the practice of planning from the achieved level will probably continue, since much of the incentive system is based on it (and despite the fact that it is actually a disincentive to maximize production).

A more intensive use of computers for economic control might yield results not possible today. For instance, the maintenance

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of large data bases of information may help the authorities uncover reporting inconsistencies and track down phony data. Planners should be able to make more use of the available data for analysis purposes. Faster reporting and analysis will be possible. Eventually, it might be possible to solve certain false data problems through the use of sensor-based collection systems integrated with automated manufacturing facilities. Not only would this be enormously costly if employed at all extensively, however; it would also require that computing be used at all levels of the hierarchy, down to the shop floor, on a near-universal basis. And it would require a tremendous telecommunications infrastructure. The Soviets will certainly not be able to achieve such computerized economic surveillance by the end of the century.

### Support for Military and Internal Security

We believe that the Soviets perceive Western high-technology military systems to be the most important potential military threat to the USSR. Consequently, we expect the Soviet military-industrial complex to focus on developing the technologies and industries needed to deal with this threat. Improving Soviet C&C technologies will be vital in this regard. Thus, considering that such improvements are also vital to the achievement of other Soviet goals, the military and civilian objectives in this area are complementary and reinforcing. Consequently, more resources are likely to be allocated to the C&C industries than would be the case if military and civilian priorities were in competition.

Military Deficiencies. Optimally, there would be a mutually beneficial, complementary relationship between a strong set of Soviet C&C industries and strong Soviet user communities. Such relationships exist in the West, where C&C development has been stimulated by demand not only from the military sector but from a voracious private sector as well. It has been argued that many of the problems of the Soviet C&C industries stem from the lack of a strong feedback relationship with a world-class user community like that in the United States. The Soviet military and military-industrial sectors enjoy high priorities and privileges, but they hardly constitute a user community on a par with those in the West. Furthermore, to the extent that Soviet C&C technology is deficient, relative to that of the West, Soviet military capabilities present and future are degraded.

Lacking the stimulation of a large private sector of their own, the Soviets use the Western private sector as a surrogate. A substantial part of the impetus for development of the Soviet C&C industries comes from the examples provided by the Western military and civilian user communities. Nevertheless, this is not enough to help the Soviets achieve parity with the West. For at least the rest of this century it is unlikely that Soviet

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progress in the C&C technologies will strengthen their military applications to the point that they will catch up with, much less surpass, those of the West.

KGB Strangely Diffident. There is little evidence that the KGB is much involved in the development of the information technologies for domestic surveillance. This is somewhat surprising, since such applications would clearly be of value to such an agency; they are within current Soviet technical capabilities; the KGB can obtain the necessary resources to obtain and employ such technologies; and there are few constraints to prevent the KGB from doing so.

In time, the security services may employ C&C technologies to develop embedded, ostensibly universal surveillance systems, such as automated telephone monitoring systems. While obvious surveillance would be offensive, even to the cowed and subservient Soviet population, an embedded system would be semitransparent. Moreover, it need not be universal, so long as everyone was conditioned to think it might be there. In the past, resource constraints prevented the Soviets from making such surveillance really pervasive. The mating of advanced computer and communication technology will not immediately bring the USSR to the Orwellian extreme, but it will undoubtedly make the present system work more effectively, and it will probably lead eventually to higher levels of routine surveillance.

Soviets Facing Dilemma. In general, the proliferation of C&C technologies does not appear to pose as great a political risk in the USSR as some Western analysts have claimed or the Soviets seem to fear. Nevertheless, the Soviet Government has long been obsessed with monopolizing sources of information and methods of disseminating it. Soviet authorities have remained very cautious about the widespread introduction of any of the information technologies that could be used to obtain increased access to information from foreign sources, to promote or coordinate dissident activities, or to increase the volume of two-way private communications.

If there is to be substantial progress toward achieving the country's goals, however, it appears to be necessary for the Soviet leadership to permit -- even to encourage -- the much expanded utilization of the information technologies among the rank and file of the Soviet citizenry. One inevitable result would be less effective controls over an expanding user base than had been possible in the past, e.g., when photocopy machines were the main concern. Control of photocopies was relatively simple, and the economic cost of exerting such control was easily acceptable. Control of the use of some of the newer technologies would be much more difficult and expensive, once they began to permeate society in a significant way. Nevertheless, we believe the Soviets have no choice but to allow at least limited

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proliferation of such technologies in at least the better educated segment of society on which they must rely for achievement of their goals.

### Image Versus Reality

The USSR has a long history of proclaiming its moral, ideological, and technological superiority over the West. These claims have been heavily larded with "scientific" justification and emphasis on the unparalleled technological progressiveness of Soviet society. Computing is one of the centerpiece technologies of the Soviet Scientific-Technological Revolution (NTR).

Obviously, if the USSR must continue to depend on acquisition of dated Western C&C technology just to keep from falling further behind the Western state of the art, Soviet claims will ring hollow both to themselves and the outside world. It will become much harder to disguise Soviet deficiencies in a world of information societies. The Soviet people will become even more disillusioned about the scientific efficacy of . Marxism-Leninism, and the gap between publicly expressed and privately held beliefs will widen. This will not help the Soviets improve morale, instill confidence in centralized planning, or promote obedience to exhortations from the center. Achievement of the country's goals would be impossible.

It is clear that Soviet leaders neither expect nor, in some cases, want their country to keep up with the West in many ways. But they feel under pressure to maintain an illusion of rough technological parity. Hence their tendency to assert, at the drop of a microchip, "We have that too." In some cases, especially those contributing to military strength or credibility, the Soviets want substance to go with the image. In others, they want a little technology to stretch a long way, e.g., to reassure the Soviet people or the country's allies that it has the capability to match Western achievements. It is becoming increasingly difficult, however, in an age of information societies, for Moscow to maintain an image that is much at variance with reality. The Soviets have less and less control over either the information about the outside world that reaches the Soviet population or the information about the USSR that reaches the outside world. Thus it is becoming necessary for the Soviets to actually become what they have been pretending to be.

### Possible Avenues of Evolution

The Soviet system is not entirely inflexible. Following are four possible avenues of Soviet economic and political development during the rest of this century. Together they define the likely boundaries of Soviet evolution.

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- o The conservative model was developed under Brezhnev and continues in use today. It combines a solid commitment to centralized planning with control with incremental changes as they appear feasible. It is accepted that the USSR will generally lag behind the West, except in a few high-priority areas. The society, it is argued, will remain stable as long as consumption remains above a minimum threshold and there is enough growth to support incentives.
- o The progressive model, as it is used in East Germany, offers a possibly palatable alternative if the Soviets find that the conservative model does not provide enough progress. This model somewhat weakens the ministerial system and grants state enterprises somewhat more autonomy. It also permits the selective use of small private enterprises in certain sectors, in recognition of the fact that there are some areas in which strong centralization is ineffective or counterproductive. So far, the East Germans have been able to deal with the stresses, inequities, and risks inherent in this approach.
- o The neo-Stalinist model involves a return to a stronger police state, reduced foreign contacts, and greater emphasis on discipline and order. In this scenario the information technologies would be used extensively for surveillance and control, although excesses of the sort common under Stalin would be avoided. Short-term gains might come through better discipline, high-investment in growth coupled with slow growth in consumption, reduction of the second economy, and so on. Over the long-term, such a system would exacerbate the problems that already make the Soviet Union uncompetitive with the West.
- o The radical model, which is more or less the system in Hungary, incorporates significant private ownership and a decentralization of planning and management. Party and government control is maintained through such measures as investment, price-setting, and taxation. From the Soviet perspective, such a system seriously compromises the authority of the center and would mean abandoning a good part of the current and longstanding Soviet system. Moreover, the Hungarian model does not seem to have promoted the development of the C&C technologies any better than alternative models, although such a system would appear to offer the sort of flexibility conducive to the rapid development of such technologies.

In this paper, we have assumed the Soviets would follow either the conservative or the progressive model, or some intermediary path. From the perspective of the development of information technologies, it does not appear to make much difference. In other words, the current system appears to serve as an adequate model on which to base projections.

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Impact on the Superpower Balance

We conclude that deficiencies in Soviet information technologies weaken the Soviet Union relative to the United States and to the West as a whole. To the extent that the gap may widen, the Soviet Union would be further weakened; and to the extent that the gap is narrowed, the Soviet Union would be strengthened.

The positions of both superpowers would be weakened should Japan or (rather less probably) Western Europe stake out preeminent positions in the information technology domain. If the United States were harmed as the result of losing a competition with Japan in C&C development, its relative position with regard to the USSR would be degraded. Despite its manifest shortcomings, the Soviet system permits Moscow to maintain a complete set of industries, even if they are not competitive by international standards. Notwithstanding this advantage, however, through the end of the century there appear to be no prospects that the USSR will achieve parity with the United States in this vital technological area. The Soviets are starting from too far back, and they do not appear willing to make the hard choices needed to bring about such a quantum jump in the development of their information technology.

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